VEGETATIVE COMPOSITION SURROUNDING DAYTIME BEDSITES OF WHITE-TAILED DEER FAWNS IN SOUTHWESTERN OKLAHOMA

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Abstract: Midsummer daytime bedsites of white-tailed deer (*Odocileus virginianus texanus*) fawns in southwestern Oklahoma were analyzed to determine the species composition of the surrounding vegetation. Vegetative composition varied between bedsites and range sites, but fawns did not bed in areas dominated by short vegetation. Fawns used 5 different range sites for daytime bedsites. Bedsites located on the 2 savannah range sites had higher percentages of woody vegetation than did bedsites located in the 3 open range sites. Grasses and grass-likes were the most abundant plant forms around all bedsites. Forbs were not a major component of the vegetation at any bedsite. Bedsites located in the boulder ridge, hilly stony, and hardland range sites were in good to excellent range condition, whereas bedsites located in hilly stony savannah and boulder ridge savannah range sites varied from poor to excellent in range condition class. Range condition class appears to be a valid index to the suitability of range sites (especially the open prairie types) for use by deer as fawn-rearing areas in the Wichita Mountains, Oklahoma.

Proc. Ann. Conf. S.E. Assoc. Fish & Wildl. Agencies 33: 259-266

The literature is replete with descriptions and appraisals of various aspects of white-tailed deer habitat. One component of habitat notable for its lack of detailed description is fawn-rearing habitat. Severinghaus and Cheatum 91956) mentioned briefly the fawn-rearing habitat component of deer summer range, but did not provide detailed descriptions. Study of this early stage of life has been difficult because young fawns exhibit cryptic behavior patterns during the first months of life (Jackson et al. 1972). Kjos and Montgomery (1969) used radio-telemetry equipment to relocate repeatedly 2 fawns in Illinois for the purpose of collecting data on daytime bedsites. Their subsequent descriptions of bedsites were qualitative and did not include data on species composition of surrounding vegetation.

The white-tailed deer of the Wichita Mountains are descendents of native herd remnants (Lindzey 1951, Halloran and Glass 1959) and are well adapted to the prairie-woodland habitat. The open prairies and wooded areas are important to fawns as locations for daytime bedsites. The objective of the current study was to determine the species composition of vegetation surrounding daytime bedsites and to compare differences in plant species composition at bedsites located on different range sites at the Wichita Mountains.

Financial support was provided by the Oklahoma Cooperative Wildlife Research Unit, Oklahoma State University (OSU); Oklahoma Department of Wildlife Conservation; School of Biological Sciences, OSU; OSU Environmental Institute; and

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Fort Sill Military Reservation, U.S. Department of the Army. R. Johnson (Wichita Mountains Wildlife Refuge) and G. Johnson (Fort Sill Military Reservation) provided access to the study area. R. Johnson also provided lodging at the refuge and invaluable assistance in conducting the study. L. Anderson, J. Ault, M. Barrington, B. Bartush, G. Waldrip, and D. Wiseman provided dedicated assistance in the field.

STUDY AREA AND METHODS

The study area is located in the Wichita Mountains complex of northwestern Comanche County, Oklahoma and has been described by Buck (1964), Crockett (1964), and Garner et al. (1976). Eight range sites (Soil Conservation Service 1967) occur within the confines of the Pinchot and Wye study areas delineated by Garner et al. (1976). The 8 range sites include: (1) loamy prairie (Lawton loam - Udic Argiustoll and Vernon clay loam - Typic Ustochrept); (2) hardland (Foard silt loam - Typic Natrustoll and Tillman clay loam - Typic Paleustoll); (3) slickspots (Hinkle clay - Mollic Natrustalf); (4) loamy bottomland (Claremont clay loam - Typic Ustifluvent, Mangum clay - Vertic Ustifluvent, and Port loam - Cumulic Haplustoll); (5) boulder ridge; (6) boulder ridge savannah; (7) hilly stony; and, (8) hilly stony savannah, with the latter 4 occurring on Brico clay loam (Udic Argiustoll) (Bartelli and Coover 1973).

A recent telemetry-aided study of fawn mortality in Oklahoma (Garner et al. 1976) provided an opportunity to collect species-composition data on vegetation surrounding midsummer daytime bedsites of young fawns. Young fawns were captured, fitted with radio transmitters, and released at their capture sites in May and June 1975. Daytime bedsites of 5 marked fawns were located by triangulating each fawn and locating its bedsite. The vegetation at each bedsite was than sampled in the following manner.

Each bedsite location was recorded on field forms and plotted onto aerial photographs. The range site for each bedsite was then determined by comparing this photo-map plot to published soil-survey photo-maps (Soil LConservation Service 1967). At each bedsite, 2, 20-m bisecting lines were established of which 1 line was placed along the axis of slope (up slope line) and the second line (cross slope line) set perpendicular to the first. The bedsite was located at the midpoint of each line (the bisection point) in the manner described by Reichelt (1973). A sharpened surveyor's pin was lowered vertically to ground level at 2-dm intervals along each line and the plant nearest to the pin at ground level was recorded at each point (200 total points per bedsite). Range condition classes at each bedsite were determined by calculating the species composition of surrounding vegetation. The percentages of climax vegetation present on each bedsite were tabulated with respect to range site and the percent range condition class (Dyksterhuis 1949) was calculated.

Statistical analyses of species-composition data using one-way classification analysis of variance and linear correlation analyses (Steel and Torrie 1960) were conducted using the statistical analysis system (SAS) computer programs (Service 1972).

Twelve species (10 grasses and 2 forbs) that occurred at the majority of the bedsites were analyzed statistically to determine if occurrence of these species was associated with certain range sites: big bluestem (*Andropogon gerardi*), switchgrass (*Panicum virgatum*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorghastrum nutans*), tall dropseed (*Sporobolus asper*), sideoats grama (*Bouteloua curtipendula*) sedges (*Carex* spp.), spike rushes (*Eleocharis* spp.), fall witchgrass (*Leptoloma cognatum*), Scribner's panicum (*Panicum oligosanthes* var. *scribnerianum*), western ragweed (*Ambrosia psilostachya*), and heath aster (*Aster ericoides*). Differences in 4 goups of species (tall, short, forbs, all-12) were also analyzed. Tall included big bluestem (ANGE), switchgrass (PAVI), little bluestem (SCSC), Indiangrass (SONU), and tall dropseed (SPAS), whereas short included sideoats grama (BOCU), sedges (CAREX), spike rushes (ELEO), fall witchgrass (LECO), and Scrbner's panicum (PAOL). Forbs included western ragweed (AMPS) and heath aster (ASER), whereas the all-12 included all 12 species.

Each species/class (species or group of species) was tested for differences between lines (up slope and corss slope) within bedsites, and differences between bedsites by analysis of variance. Data from the 2 lines were then pooled within each bedsite for each species/class and tested for differences between range sites. Least significant differences (LSD) values were used to determine which species/class means were different ($P = 0.05$). Linear corrleation analyses were used to determine significant relationships between species/classes ($P = 0.05$).

All locations of nonmoving fawns (fawn not moving when triangulated and assumed bedded, or fawn observed bedded) were recorded during the intensive vegetation sampling peiod. These locations were recorded for the 5 fawns and were compared to range site availability on the study area.

RESULTS AND DISCUSSION

A total of 28 daytime bedsites of 5 different female fawns were sampled between 30 June and 18 August 1975. Fawn ages at the time of sampling ranged from 29 to 86 days and sample times ranged between 0755 and 1822 hr. These bedsites were located on 5 of the 8 range sites within the study areas. The sampled bedsites indicated a preference for range sites in the excellent (75-100%) and good (50-74%) range condition classes (Table 1). Only 3 bedsites were located on fair (25-49%) or poor (0-24%) condition range sites, and these 3 bedsites were confined to the 2 savannah range sites when woody cover might offset some negative aspects of low range condition classes (Table 1).

TABLE 1. Range site classification and range condition class of vegetation surrounding 28 daytime bedsites of white-tailed deer fawns in the Wichita Mountians, Oklahoma, 1975.

Fawn number (range in days of age)	Number of observations	Range site	% range condition X ± SD
B-4	4	Boulder ridge	73±14.3
(59-86)	2	Boulder ridge savannah	40±28.3
B-14	4	Boulder ridge	73±6.2
(60-74)			
C-3	5	Hilly stony	75±12.7
(61-75)	1	Hardland	76
C-4	3	Hilly stony	81±6.8
(63-76)	3	Hilly stony savannah	55±23.8
C-8	4	Hilly stony	71±6.1
(29-78)	1	Hilly stony savannah	21
	1	Hardland	77

A total of 86 species was encountered on the sampled bedsites. There was no significant variation of the major 16 species/classes between lines within bedsites, therefore subsequent statistical analyses used pooled % composition data for the 2 lines at each bedsite.

Vegetation surrounding daytime bedsites in the hardland range site consisted primarily of tall dropseed, little bluestem, big bluestem, western ragweed, Scribner's panicum, Indiangrass, silver bluestem (*Bothriochloa saccharoides*), and heath aster (Table 2). The hardland range site is more xeric than the boulder ridge and hilly stony

TABLE 2. Average percent composition of vegetation surrounding fawn daytime bedsites on five range sites in the Wichita Mountains, Oklahoma, 1975.

Species	Range site				
	Hardland	Boulder ridge	Boulder ridge savannah	Hilly stony	Hilly stony savannah
Grasses and grasslikes:					
Tall group	58.1 b	59.9 b	29.3 a	66.7 b	37.7 a
Angropogon gerardi	14.0 ab[x]	22.1 bc	t[y] a	33.4 c	19.3 bc
Panicum virgatum	2.0 ab	10.4 b		10.5 b	t a
Schizachyrium scoparium	17.0	15.7	14.5	14.9	14.5
Sorghastrum nutans	5.8 c	6.1 c		2.8 b	2.6 b
Sporobolus asper	19.3 b	5.6 a	14.0 b	5.1 a	1.3 a
Short group	10.5	20.8	3.8	15.8	13.9
Bouteloua curtipendula	t a	4.1 b	t a	1.8 ab	t a
Carex spp.	2.5	t	3.0	t	9.4
Eleocharis spp.	t	4.7		9.6	2.0
Leptoloma cognatum	1.0	3.4		1.4	t
Panicum oligosanthes var. *scriberianum*	5.8 bc	7.9 c	a	2.1 ab	1.8 ab
Other grasses and grasslikes					
Bothriochloa saccharoides	4.8			t	
Sporobolus cryptandrus		t	15.6	t	
Other (6 spp.)	1.3	t	t	t	1.1
Forbs:					
Forb group	11.3	5.8	t	7.5	5.6
Ambrosia psilostachya	7.8	4.4	t	6.4	5.4
Aster ericoides	3.5 c	1.4 b		1.0 ab	t ab
Others (8 spp.)	t	t	t	t	t
All 12 group	79.8c	86.5 c	33.5 a	89.9 c	57.3 b
Shrubs:					
Rhus aromatica			29.5		
Rhus radicans				t	7.8
Others (4 spp.)		t	t	t	1.0
Trees:					
Juniperus virginianus		t	1.3	t	t
Quercus marilandica			1.3		1.1
Others (4 spp.)				t	2.8

[x]Means in each row followed by the same letter(s) are not significantly different ($P \leq 0.05$)
[y]t = less than 1%

range sites (Soil Conservation Service 1967), therefore, the more xeric plant species were evident around these bedsites. Crockett (1964) reported that hardland range site soils

were dominated by little bluestem (33.3%), big bluestem (12.3%), blue grama (*Bouteloua gracilis* - 10.8%), and buffalo grass (*Buchloe dactyloides* - 8.2%). Although these plant species were still present on the hardland range site, fawns were not observed bedded in areas having high percentages of blue grama or buffalo grass. These short species offer sparse cover for bedded fawns, a factor that appears to be important in determining the use of an area as a bedsite by fawns (Garner 1976).

Bedsites in the boulder ridge and hilly stony range sites were surrounded by similar vegetation (Table 2), except that boulder ridge bedsites had higher percentages of Scribner's panicum and Indiangrass than the hilly stony bedsites. Crockett's (1964) data on boulder ridge range site soils are somewhat comparable to these data (Table 2), but his data on the hilly stony soils indicate different plant composition there. The hilly stony soils (Crockett 1964) were dominated by big bluestem, little bluestem, hairy grama (*Bouteloua hirsuta*), and blue grama. Although the grama species were present on the hilly stony range sites, fawns did not use those areas for bedsites. Fawns bedded in areas with taller grasses (i.e., the bands of deeper soils in the joints of underlying bedrock as described by Crockett 1964).

Similar kinds of vegetation surrounded the bedsites on 2 savannah range sites (Table 2) except that the hilly stony savannah range site was more mesic. Woody species on the boulder ridge savannah site were primarily oaks (*Quercus* spp.) and skunkbrush (*Rhus aromatica*), whereas the primary woody species on the hilly stony savannah were poison ivy (*Rhus radicans*), maple (*Acer saccharum*), black walnut (*Juglans nigra*), and elm (*Ulmus americana*). The more mesic grasses and grasslike plants (sedges, big bluestem, and Indiangrass) were more common on the hilly stony savannah bedsites.

Bedsites located on the 2 savannah range sites had higher total percentages of woody vegetation than did the 3 open prairie range sites (Fig. 1). Oaks, cedars, and skunkbrush were the major woody species on the boulder ridge range savannah site, whereas a wider variety of species composed the woody vegetation on the hilly stony savannah range site (Table 2). Grasses and grass-likes were the most abundant plant forms around all bedsites, but bedsites located on the 2 savannah range sites had a lower total percentage of grasses and grass-likes than did those on the open prairie range sites (Fig. 1). The species mixture of grasses and grass-likes on boulder ridge and hilly stony savannahs were similar, whereas bedsites on the hardland range site had less big bluestem and switchgrass. The hardland bedsites had more silver bluestem, sedges, and tall dropseed than did bedsites located on boulder ridge and hilly stony range sites. The high percentage of forbs on the hardland range site (Fig. 1) resulted from greater abundance of western ragweed and heath aster than on the other range sites (Table 2).

Some degree of selection for bedsites in certain range sites was evident when 295 daytime locations of nonmoving fawns were compared to range site percentages available on the study area (Table 3). The loamy bottomland and slickspot range sites were not used, whereas the loamy prairie was used to a low degree in proportion to its availability. Hilly stony, hilly stony savannah, and boulder ridge savannah were used by fawns as bedsites to a high degree in proportion to their availability. Hardland and boulder ridge range sites used as bedsites were approximately equal to their availability.

Species/class percentages by range site differed significantly in 9 of the 16 species/classes (Table 2). Differences existed between certain range sites for big bluestem, switchgrass, Indiangrass, tall dropseed, sideoats grama, Scribner's panicum, and heath aster. Two of the class percentages also differed (tall and all-12) between range sites. These data indicate that the 2 savannah range sites had lower percentages of occurrence for the majority of the tall grasses and the tall group, and that hardland range sites resembled the 2 savannah sites with the presence of big bluestem and switchgrass. The all-12 group occurred in lowest percentage on the boulder ridge savannah range site, and had an intermediate percentage of occurrence on the hilly stony savannah. The remaining 3 range sites had similar percentages of the all-12 group.

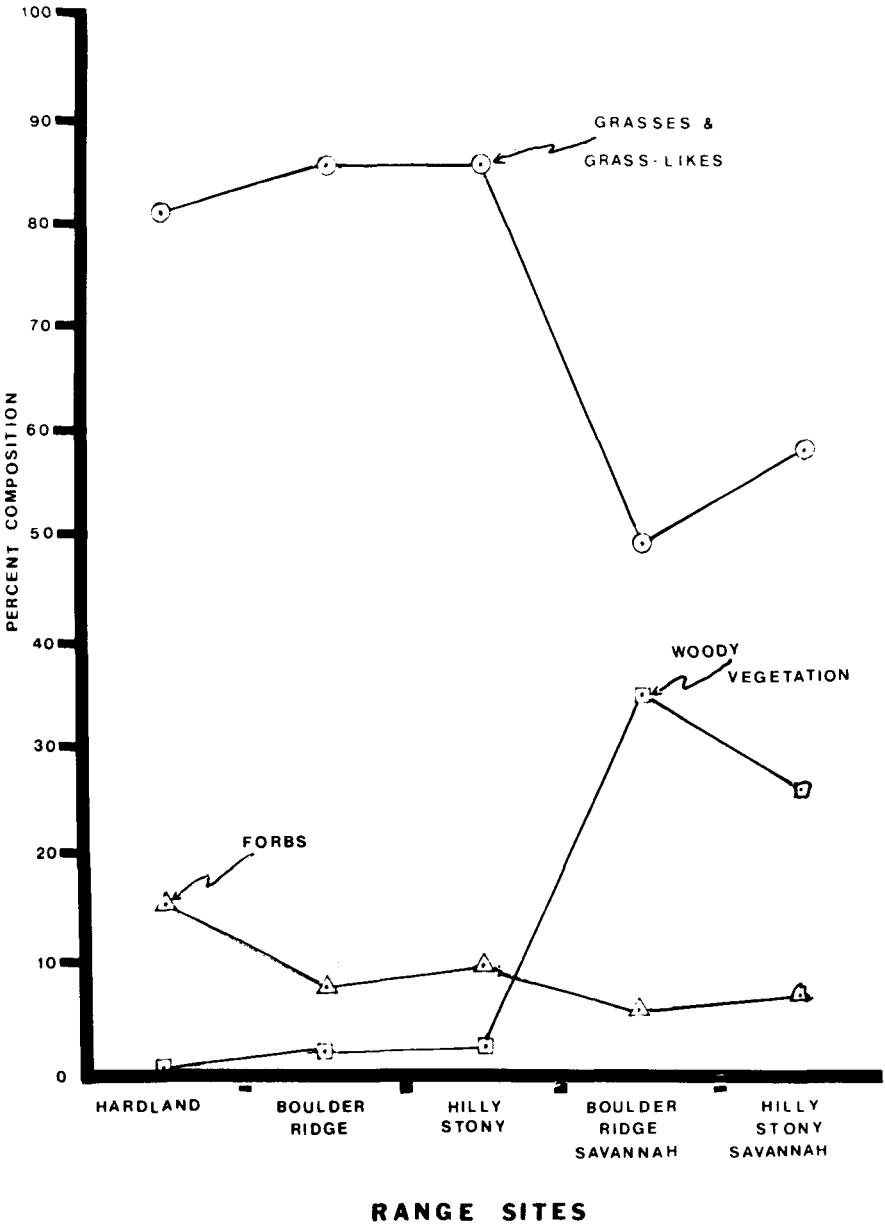

Fig. 1. Composition of vegetation surrounding daytime fawn bedsites for each range site as determined from the more common species, Wichita Mountains, Oklahoma. 1975.

Correlation analyses detected many statistically significant linear relationships between the 16 species/classes (Table 4). Most of these correlations simply verified the classification of each species with its appropriate group. Most of the correlation

TABLE 3. Utilization of range sites as fawn bedsites in relation to their availability on the study areas, Wichita Mountains, Oklahoma, 1975.

Range site	% Occurrence of range sites available on study areas	Proportion of 295 locations of nonmoving fawns within each range site (% occurence)
Loamy bottomland	3.5	0.0
Loamy prairie	6.3	2.7
Slickspots	0.4	0.0
Hardland	6.9	5.8
Hilly stony	29.6	37.0
Hilly stony savannah	19.9	21.0
Boulder ridge	25.3	22.4
Boulder ridge savannah	8.3	11.2

TABLE 4. Correlation matrix for the 12 plant species and 4 species/classes occurring around daytime fawn bedsites,Wichita Mountains, Oklahoma. 1975.

	AMPS	ANGE	ASER	BOCU	CAREX	ELEO	LECO	PAOL	PAVI	SCSC	SONU	SPAS	SHORT	TALL	FORB	ALL 12
AMPS	1	0.04	0.20	0.01	0.01	-0.09	-0.06	-0.14	0.06	-0.10	-0.01	0.01	-0.13	0.00	0.95[a]	0.16
ANGE		1	-0.11	-0.10	-0.35[a]	-0.02	-0.12	0.01	-0.02	0.06	-0.09	0.20	-0.26[a]	0.72[a]	0.01	0.53[a]
ASER			1	0.05	0.10	-0.15	0.15	0.31[a]	0.11	0.18	0.02	0.15	-0.01	0.13	0.47[a]	0.25[a]
BOCU				1	-0.17	-0.11	0.35[a]	0.31[a]	-0.05	0.27[a]	0.31[a]	0.17	0.25	0.04	0.02	0.20
CAREX					1	0.03	-0.10	-0.13	-0.14	-0.27[a]	-0.21	-0.09	0.46[a]	-0.57[a]	-0.02	-0.27[a]
ELEO						1	0.11	-0.18	0.54[a]	-0.48[a]	0.12	-0.06	0.66[a]	-0.05	-0.13	0.34[a]
LECO							1	0.23	0.01	0.11	0.16	-0.19	0.42[a]	-0.08	-0.02	0.18
PAOL								1	-0.01	0.18	0.09	0.01	0.29[a]	0.12	-0.04	0.28[a]
PAVI									1	-0.40[a]	0.24	-0.06	0.30[a]	0.23	0.09	0.43[a]
SCSC										1	0.16	-0.07	-0.34[a]	0.38[a]	-0.04	0.14
SONU											1	0.11	0.10	0.17	-0.01	0.23
SPAS												1	-0.18	0.21	0.05	0.10
SHORT													1	-0.31[a]	-0.11	0.29[a]
TALL														1	0.04	0.78[a]
FORB															1	0.23
ALL 12																1

[a]Significant correlation coefficients ($P \leq 0.05$)

coefficients were relatively low, but several ralationships between species in different groups were also evident. The percent composition of sedges declined where big bluestem increased; spike rush composition declined when composition of little bluestem increased. These relationships were expected because the 2 grasses are more xeric in habitat requirements than are sedges. Where switchgrass increased in percent composition, other wet species (sedges and spike rushes) also increased. These data indicate that individual species composition of vegetation surrounding daytime bedsites of fawns varied from bedsite to bedsite and was not strongly correlated with other species across all 5 range sites. This phenomenon is a result of some species being common to all range sites and other species being restricted to specific range sites (Table 2).

CONCLUSIONS AND APPLICATIONS

These data provide baseline information on fawn-rearing habitat in southwestern Oklahoma and should be useful in further evaluations of habitat quality for deer in the Wichita Mountains, Oklahoma. The range manager's concept of the range site appears to have merit for use in fawn-rearing habitat appraisal for white-tailed deeer. This study suggests that range condition classes in the Wichita Mountains may be important in determining the suitability of rangeland habitat for fawn-rearing habitat. Open paririe range sites that are in poor or fair condition appear to be avoided by fawns for use as daytime bedsites, although savannah range sites in poor and fair condition may be used occasionally by fawns. The management strategy for rangelands in the Wichita's should provide for retention and development of good and excellent range condition classes on the various range sites for continued used as fawn rearing habitat.

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